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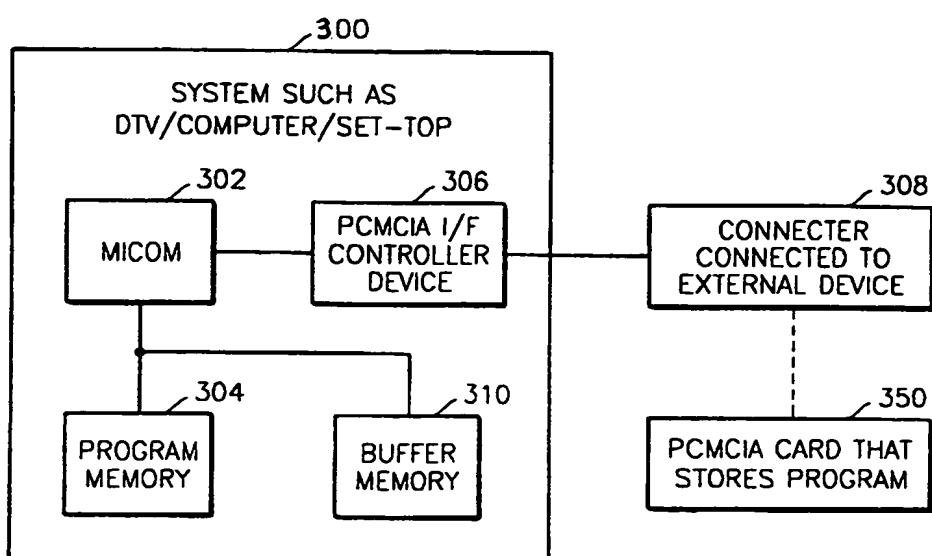
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(54) Abstract Title

Software upgrading

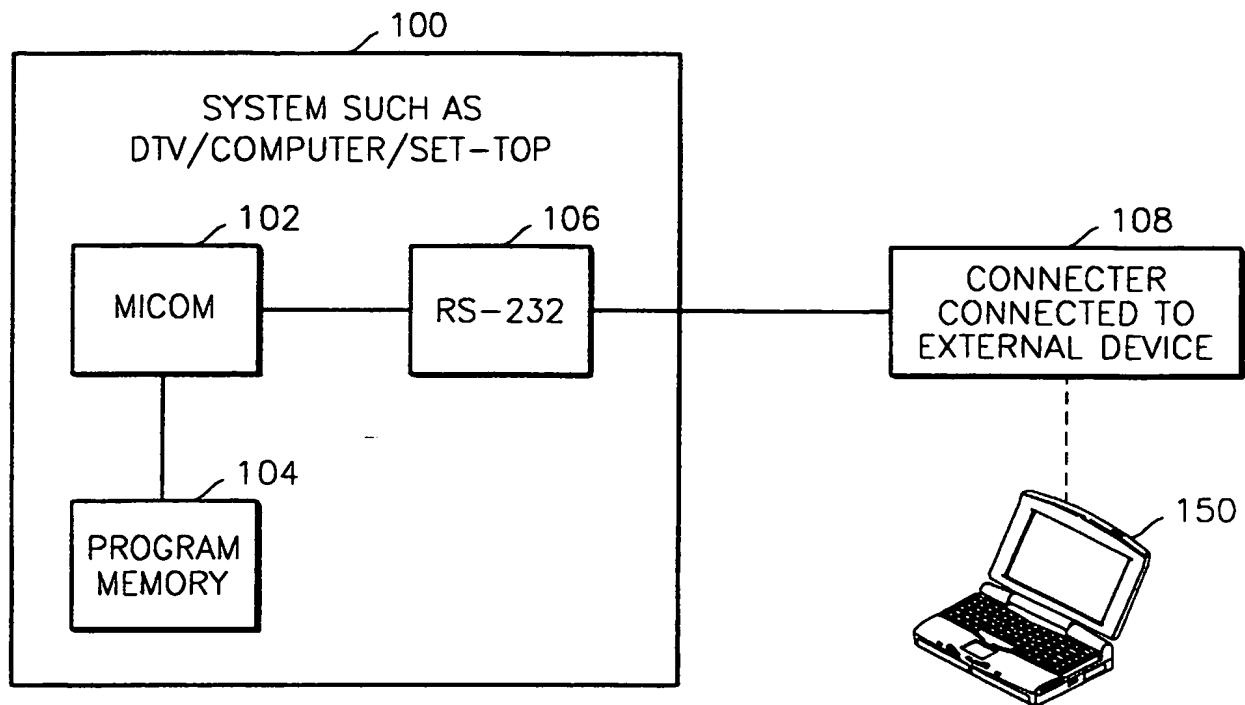
(57) A program-controlled apparatus (300) can have its software upgraded from a data carrier (350), preferably a PCMCIA card. Upgrade software is read from the data carrier (350) into a buffer location (310). The upgrade is then performed when the program-controlled apparatus (300) is next rebooted. The boot program (304a) can determine that an upgrade is to be performed by checking an upgrade flag (312) which is set when the upgrade software is written into the buffer location (310). The program-controlled apparatus may be a set-top box for digital television.

FIG. 3



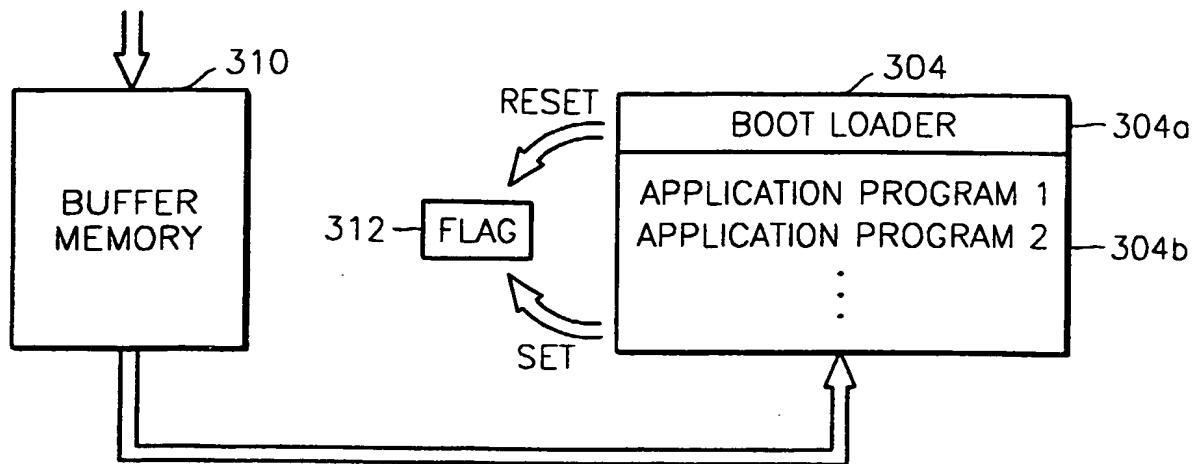
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FIG. 1



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FIG. 4



Software Upgrading

Description

5 The present invention relates to upgrading the software of a program-controlled apparatus.

Known digital televisions and a set-top boxes have microprocessors and a control programs. The programs are loaded into non-volatile memory when the systems are manufactured in a factory, and can be modified and upgraded by service engineers 10 after the systems have been released. As analogue broadcasting is giving way to digital broadcasting, the present digital broadcast specifications may be changed making the control programs obsolete.

15 Consequently, a easy upgrade method is desirable.

Figure 1 illustrates a known method of upgrading a program.

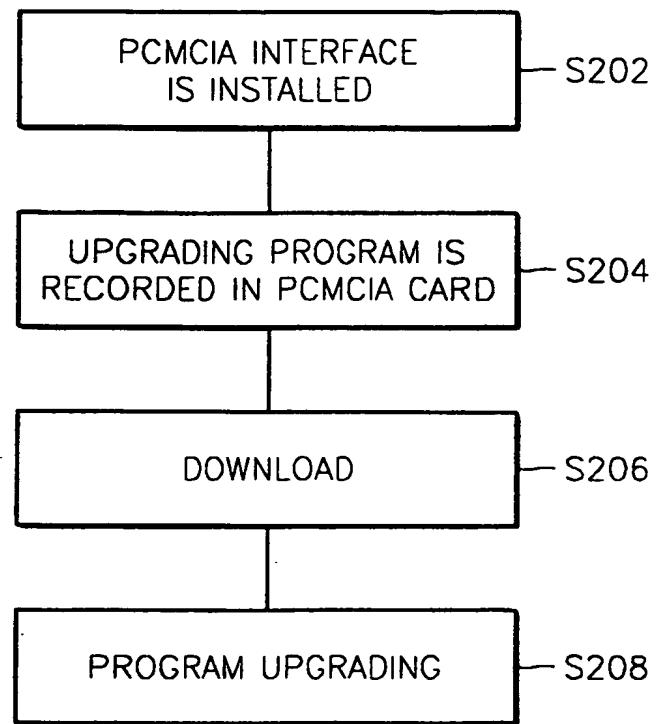
With reference to Figure 1, a system 100 is controlled by a microprocessor 102. A program that controls the microprocessor 102 is stored in a program memory 104. 20 The program memory 104 is implemented using a non-volatile memory, such as a flash read-only memory (ROM), an electrically erasable and programmable read-only memory (EEPROM) and non-volatile random access memory (NVRAM).

25 The NVRAM is a non-volatile RAM that can protect recorded data even though an external power of a computer is turned off or lost. Some modems use the NVRAM as a memory that saves a telephone number designated by a user or a setup value of the modem.

30 In some cases, the program stored in the program memory 104 of the system 100 shown in Figure 1 needs to be upgraded for improvement, addition of performance and elimination of a bug.

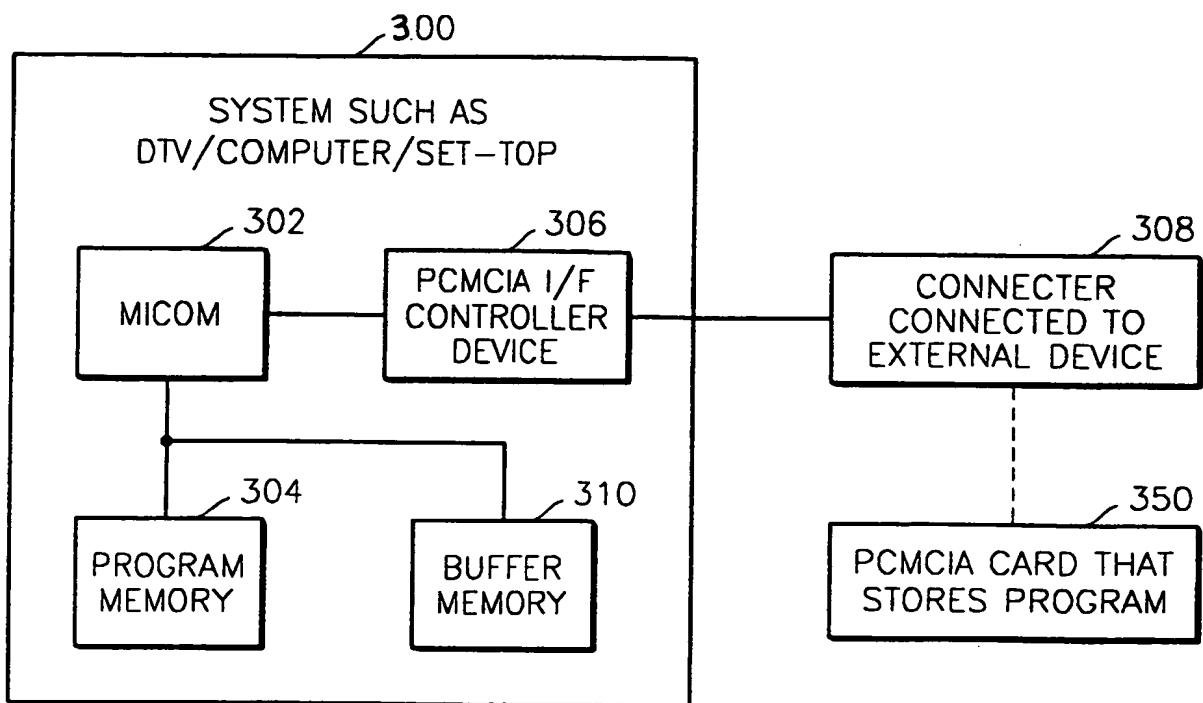
214

FIG. 2



314

FIG. 3



For upgrading, the system 100 shown in Figure 1 includes an RS-232C interface 106 and an RS-232C connector 108 that can be connected to an external computer 150. RS-232C is a specification that defines a physical connection and a protocol that enable devices to perform a serial data communication at relatively low speeds.

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The external computer 150 is a portable notebook PC.

To upgrade the program, the service engineer connects the external computer 150 and the system 100, using the RS-232C cable, and downloads an upgrading program 10 10 from the external computer 150. The downloaded program upgrades the program stored in the program memory 104.

15 In a boot area of the program memory 102, there is a boot loader which controls the program upgrading. The boot loader stores the downloaded program in an empty area of the RAM or the program memory 104, and upgrades the existing program using the downloaded program.

20 After the program upgrading has been completed, the system is rebooted. The boot loader loads the upgraded program and the system is controlled by the upgraded program.

25 When upgrading the program of the system shown in Figure 1, the service engineer must carry the notebook PC which holds the upgrading program and connect the external computer with the system 100 using the RS232C cable in order to upgrade the program.

Therefore, the existing program upgrade process is disadvantageous in that it necessitates a complicated process and the external computer.

30 According to the present invention, there is provided a software upgrading method comprising:

arranging a data carrier holding upgrade software and program-controlled apparatus relative to each other such that said upgrade software can be read by the program-controlled apparatus;

5 operating the program-controlled apparatus to read the upgrade software into a buffer location in the program-controlled apparatus; and

operating the program-controlled apparatus to upgrade the control software of the program-controlled apparatus in dependence on said upgrade software stored in said buffer location.

10 Preferably, the method includes the program-controlled apparatus operating to set a flag to indicate that upgrade software has been stored in the buffer location, rebooting the program-controlled apparatus and during rebooting the program-controlled apparatus operating to check said flag and, if the flag has been set, upgrade said control software in dependence on said upgrade software, stored in 15 said buffer location, and reset said flag.

Preferably, said control software is stored in non-volatile solid-state memory.

Preferably, the data carrier is a PCMCIA card.

20 According to the present invention, there is also provided a program-controlled apparatus comprising a processor, a memory and means for accessing a data carrier for reading data therefrom, wherein the memory stores a control program for the processor for controlling the apparatus to read upgrade software from a data carrier 25 via said means for accessing a data carrier into a buffer location and a control program for upgrading the control software of the apparatus in dependence on the upgrade software in the buffer location.

30 Preferably, the memory includes a control program for setting a flag to indicate that upgrade software has been stored in the buffer location and the control program for upgrading the control software comprises boot program which causes the processor to check said flag and, if the flag has been set, upgrade said control software in

dependence on said upgrade software, stored in said buffer location, and reset said flag.

Preferably, the means for accessing a data carrier comprises a PCMCIA slot.

5

Preferably, memory is non-volatile solid-state memory.

Preferably, the buffer location is predetermined.

10 Embodiments of the present invention will now be described, by way of example, with reference to Figures 2 to 4 of the accompanying drawings, in which:

Figure 1 illustrates a known method of upgrading a program;

Figure 2 is a flowchart illustrating a method of upgrading a program according to the present invention;

15 Figure 3 is a block diagram showing the configuration of a program upgrading apparatus according to the present invention; and

Figure 4 is a detailed illustration of a process in which the program upgrading apparatus shown in Figure 3 performs an upgrade using a downloaded program.

20 A program upgrading method according to the present invention uses a PCMCIA (Personal Computer Memory Card International Association) card. The PCMCIA is an international standard association which was established in 1989 in order to develop a specification on an IC card and improve interworking between mobile computers.

25

The PCMCIA defined an I/O interface comprising a 68-pin connector for memory cards and prepared specifications for a socket service and a card service.

30 As demands for high-speed applications such as multimedia and high-speed networking have been on the increase recently, the PCMCIA has established specifications for a card bus and a zoomed video for MPEG video and 100 Mbps applications. The PCMCIA continued to add specifications in order to enhance compatibility and added 3.3 V operation and a power management function for

mobility. The PC card of the PCMCIA is applied to not only a mobile computer, but also digital cameras, a cable TVs, set-top boxes and cars.

5 The physical specifications include Type I, Type II and Type III. The three physical specifications use a 69-pin connector with the same width (54 mm) and length (85.6 mm) but with different thicknesses (3.3, 5.0, 10.5 mm). Due to the different thicknesses, the three physical specifications are used for different applications.

10 Type I is used for a memory such as RAM, flash, OTP and SRAM. Type II is used for faxmodems, data modems, NICs (network interface card) and memory devices.

15 Type III is used for hard disks.

Referring to Figure 2, a PCMCIA interface device is installed in the system in step S202. The PCMCIA interface device includes the connector to which the PCMCIA card is connected.

15 The PCMCIA card storing the upgrading program is connected to the PCMCIA connector of the system in step S204.

The upgrading program is downloaded from the PCMCIA card in step S206.

20 The existing installed program is upgraded by the downloaded program in step S208.

25 Since the program upgrading method according to the present invention does not use an RS232C connection, the external computer is not needed, and connection to and downloading from the external computer are not required. Therefore, the program upgrading can be performed easily and quickly.

30 Referring to Figure 3, a system 300 is controlled by a microprocessor 302. The program that controls the microprocessor 302 is stored in a program memory 304. The program memory 304 is implemented using a non-volatile memory, such as a flash ROM, EEPROM and a non-volatile random access memory (NVRAM), that can be written to for upgrading the program.

In some cases, the program stored in the program memory 304 of the system 300 shown in Figure 3 needs to be upgraded for making improvements, adding features and fixing bugs.

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For the program upgrading, the system 300 shown in Figure 3 includes a PCMCIA interface unit 306 and a PCMCIA connector 308.

10 To upgrade the program, the service engineer inserts the PCMCIA card 350 storing the upgrading program into the PCMCIA connector 308, and downloads the upgrading program. The downloaded program is stored in a buffer memory 310 temporarily and upgrades the program stored in the program memory 304.

15 The downloaded program may be compressed. Thus, before the program upgrading, the compressed program may need to be decompressed.

20 In a boot area of the program memory 302, there is a boot loader that is a program which controls the program upgrading. The boot loader stores the downloaded program in an empty area of the buffer memory 310 or the program memory 304, and upgrades the existing program using the downloaded program.

After the program upgrading is completed, the system is rebooted. The boot loader loads the upgraded program and the system is controlled by the upgraded program.

25 Referring to Figure 4, the program memory 304 includes a boot loader area 302a that stores the boot loader, and a main program area 302b that stores a main program. The buffer memory 310 may be a non-volatile memory where additional writing can be performed, or a reserved space of the program memory 304.

30 A menu program is used to select downloading/upgrading. The menu program is included in the main program.

That is, a user selects the upgrading of the program in a menu program. If the user enters a request for program upgrading, the upgrading program is downloaded from the PCMCIA card 350. The downloaded program is stored in the buffer memory 310.

5

When the downloading is completed, an upgrade flag, stored in the EEPROM 312, is set and the system is rebooted. The EEPROM 312 may be an additional memory module which is separated physically from the program memory 304. In addition, the address of the EEPROM 312 may constitute a part of a common address space 10 with the program memory 304.

When the system is rebooted, the boot loader controls the installation of the main program, and refers to the flag for upgrading of the program stored in the EEPROM 312. If the flag is set, the downloaded program stored in the buffer 15 memory 310 is written to the main program area 302b, thereby upgrading the program.

After the program is upgraded, the boot loader resets the flag for upgrading of the program stored in the EEPROM 310 and reboots the system.

20

When the system is rebooted, the boot loader refers to the flag for upgrading of the program stored in the EEPROM 312. If the flag is reset, the main program recorded in the main program area 302b is loaded.

25 After the above process, the main program controls the system.

As described above, the program upgrading method according to the present invention can upgrade the program easily, using the PCMCIA interface.

Claims

1. A software upgrading method comprising:
arranging a data carrier holding upgrade software and program-controlled
5 apparatus relative to each other such that said upgrade software can be read by the
program-controlled apparatus;

operating the program-controlled apparatus to read the upgrade software
into a buffer location in the program-controlled apparatus; and

10 operating the program-controlled apparatus to upgrade the control software
of the program-controlled apparatus in dependence on said upgrade software stored
in said buffer location.

2. A method according to claim 1, wherein the buffer location is
predetermined.

15 3. A method according to claim 1 or 2, including the program-controlled
apparatus operating to set a flag to indicate that upgrade software has been stored in
the buffer location, rebooting the program-controlled apparatus and during
rebooting the program-controlled apparatus operating to check said flag and, if the
20 flag has been set, upgrade said control software in dependence on said upgrade
software, stored in said buffer location, and reset said flag.

4. A method according to claim 1, 2 or 3, wherein the data carrier is a PCMCIA
card.

25 5. A method according to any preceding claim, wherein said control software is
stored in non-volatile solid-state memory.

30 6. A program-controlled apparatus comprising a processor, a memory and
means for accessing a data carrier for reading data therefrom, wherein the memory
stores a control program for the processor for controlling the apparatus to read
upgrade software from a data carrier via said means for accessing a data carrier into

a buffer location and a control program for upgrading the control software of the apparatus in dependence on the upgrade software in the buffer location.

7. An apparatus according to claim 6, wherein the buffer location is
5 predetermined.

8. An apparatus according to claim 6 or 7, wherein the memory includes a control program for set a flag to indicate that upgrade software has been stored in the buffer location and the control program for upgrading the control software
10 comprises boot program which causes the processor to check said flag and, if the flag has been set, upgrade said control software in dependence on said upgrade software, stored in said buffer location, and reset said flag.

9. An apparatus according to claim 6, 7 or 8, wherein the means for accessing a
15 data carrier comprises a PCMCIA slot.

10. An apparatus according to any one of claims 6 to 9, wherein memory is non-volatile solid-state memory.

20 11. A method for upgrading a program stored in a memory in a system which includes a microprocessor and the memory that has a program designed to control the microprocessor, the program upgrading method comprising:

installing a Personal Computer Memory Card International Association
(PCMCIA) interface device in the system;

25 recording the upgrading program in a PCMCIA card;
downloading the upgrading program from the PCMCIA card through the PCMCIA interface device installed in the system under the control of the program stored in the memory; and

30 upgrading the program stored in the memory with the downloaded program under the control of the program stored in the memory.

12. A method for upgrading a program stored in a memory in a system which includes a microprocessor, application programs designed to implement a specific

operation by controlling the microprocessor, the memory that stores a boot program designed to control the load of the application programs during booting, and a Personal Computer Memory Card International Association (PCMCIA) interface unit, the program upgrading method comprising:

- 5 downloading an upgrading program from the PCMCIA card through the PCMCIA interface device under the control of the application programs stored in the memory;
- saving the program downloaded under the control of the application programs stored in the memory in a buffer memory area;
- 10 setting a flag indicating the program upgrading in the memory area which is referred to by a boot loader and rebooting the system; and
- upgrading the application programs stored in the memory with the program stored in the buffer memory area and resetting the flag if the flag is set.

15 13. A system using a microprocessor comprising:
 a microprocessor;
 a memory having application programs designed to implement a specific operation by controlling the microprocessor and a boot program deigned to control the load of the application programs during booting; and

- 20 a Personal Computer Memory Card International Association (PCMCIA) interface unit,
 wherein the application programs download an upgrading program from a PCMCIA card through the PCMCIA interface device, store the downloaded program in the buffer memory area, set a flag indicating the program upgrading in a memory area referred to by a boot loader, reboot the system, and if the flag is set, the boot loader upgrades the application programs stored in the memory with the program stored in the buffer memory area by resetting the flag.



INVESTOR IN PEOPLE

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Claims searched: 1 to 13

Examiner: Jim Calvert
Date of search: 1 October 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): G4A(AFL)

Int Cl (Ed.7): G06F 9/445

Other: Online: EPODOC, WPI, PAJ, TDB, XPESP, INSPEC, EXPLORE

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP01087294A2 (NORTEL) See e.g. para. 0050	X:1,2,6,7 Y:4,5,9,10
X	WO2000/72276A1 (BOSCH) Whole document	X:11 Y:4,5,9,10
X	US6021276 (IBM) See col. 6, ll. 19-59	X:1,2,6,7 Y:4,5,9,10
X	JP2002163110A (YOKOGAWA) See WPI abstract, accession no. 2002-496397	X:1,2,6,7 Y:4,5,9,10
X	JP2000172508A (NEC) See WPI abstract, accession no. 2000-469514	X:1,2,6,7 Y:4,5,9,10
X	JP2000148502A (NEC) See WPI abstract, accession no. 2000-434244	X:1,2,6,7 Y:4,5,9,10

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.